

Claims

1. A hydraulic control circuit for a hydraulic cylinder having first and second chambers separated by a piston fixed to a piston rod, comprising: a hydraulic reservoir, a hydraulic pressure source; a control valve which selectively connects at least said first chamber of the hydraulic cylinder over a first supply line with said hydraulic pressure source or said hydraulic reservoir; a first hydraulic line extending between said first chamber and said reservoir; a first on-off valve that controls the flow through said first hydraulic line between said first chamber and said reservoir; said first on-off valve normally being in a position blocking flow through said first hydraulic line toward said reservoir and being responsive to a control signal for establishing a fluid path between said first chamber and said reservoir so as to establish a floating position; and a valve arrangement contained and arranged in said first hydraulic line for controlling flow rate between said first chamber and said reservoir.

2. The hydraulic control circuit, as defined in claim 1, wherein said valve arrangement includes a set-up agent for changing the through-flow opening and which is coupled for receiving respective pressure signals from said first chamber and from said hydraulic reservoir and for receiving a spring force.

3. The hydraulic control circuit, as defined in claim 2, wherein said set-up agent operates so as to respectively reduce and increase a flow cross section across said valve arrangement in response to increasing and reducing pressure gradients.

4. The hydraulic control circuit, as defined in claim 3, wherein said valve arrangement includes a flow control valve coupled between said first chamber and reservoir and being operative for changing the flow rate as a function of the flow and limits it to a predetermined optimum value.

5. The hydraulic control circuit, as defined in claim 4, wherein said valve arrangement includes a check valve coupled in parallel to said flow control valve and being operable for opening only in the direction of said first chamber.

6. The hydraulic control circuit, as defined in claim 3, wherein said set-up agent further acts to reduce or interrupt a flow rate between said first chamber and said reservoir when a predetermined pressure gradient is exceeded.

7. The hydraulic control circuit, as defined in claim 6, wherein said valve arrangement includes a pipe break safety valve which closes when a predetermined pressure gradient is reached or exceeded and opens when the predetermined pressure gradient is not reached.

8. The hydraulic control circuit, as defined in claim 7, wherein said valve arrangement includes one of a throttle or orifice arranged parallel to said pipe break safety valve for permitting a reduced flow rate when said pipe break safety valve is closed.

9. The hydraulic control circuit, as defined in claim 1, wherein a second supply line is coupled between said second chamber of said hydraulic cylinder and said control valve; and said control valve being operable for selectively connecting said second chamber of said hydraulic cylinder with said hydraulic pressure source or with said hydraulic reservoir.

10. The hydraulic control circuit, as defined in claim 9, wherein a second hydraulic line is connected between said second chamber of said hydraulic actuator and said reservoir; and a second on-off valve being located in said second hydraulic line and being operable, on the basis of said control signal, to move to an open position wherein it establishes fluid communication between said second chamber and said reservoir, whereby a floating position can be provided, in which the said first and second chambers are connected directly or indirectly with each other over said hydraulic reservoir.

11. The hydraulic control circuit, as defined in claim 9, wherein a load-holding valve arrangement is coupled in at least one of said first and second supply lines for normally preventing flow from said at least one of said first and second supply lines to said reservoir by way of said control valve.

12. The hydraulic control circuit, as defined in claim 11, wherein said load-holding valve arrangement includes a stop valve; a spring biasing said stop valve to a closed position preventing flow to said control valve; a pilot pressure line coupled between at least one of said first and second chambers and said stop valve in opposition to said spring, whereby said stop valve opens as a function of the pressure in said at least one of said first and second chambers; and said load-holding valve

further including a check valve arranged parallel to said stop valve, where the check valve opens in the direction of said hydraulic cylinder.

13. The hydraulic control circuit, as defined in claim 10, wherein said first and second on-off valves are seat valves which can be switched electromagnetically.